

Engineered Surface Finishing of HVOF Tungsten Carbide

PETEOS

HDP

Lo-K

TEOS

BPSG



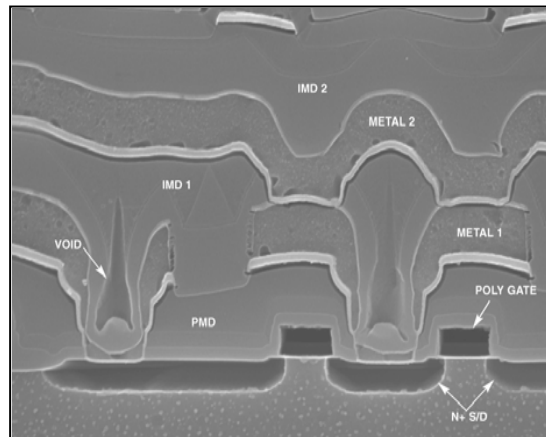
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Introduction to Cabot Microelectronics

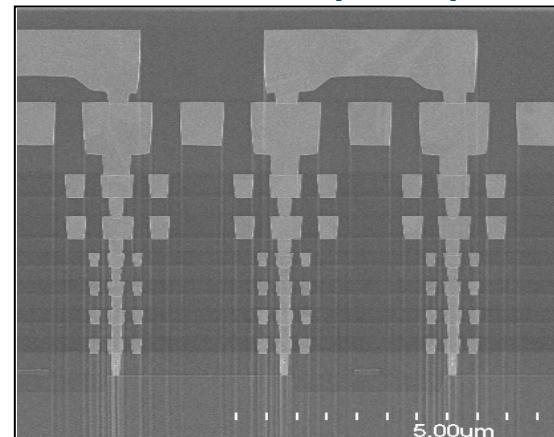
Cabot Microelectronics' History

- ◆ 1983 – CMP technology invented
- ◆ 1990 – Cabot Microelectronics established a division of Cabot Corporation
- ◆ 2000 – Initial Public Offering and Spin-off to a fully independent company

Chemical Mechanical Planarization (CMP)



Non-planarized IC product



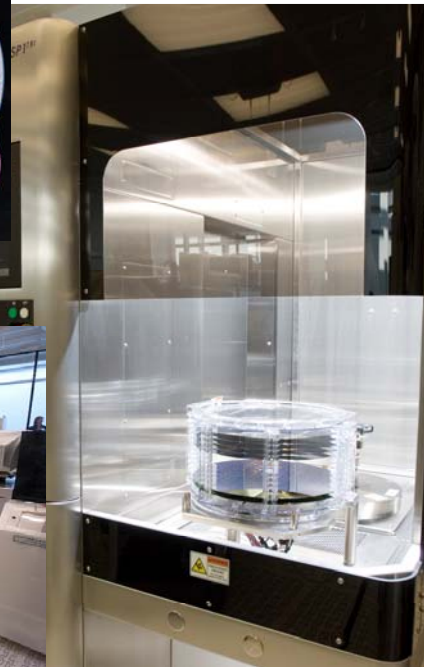
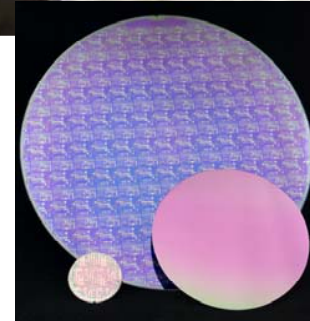
Planarized IC product

CMC's Operations Worldwide



Cabot Microelectronics

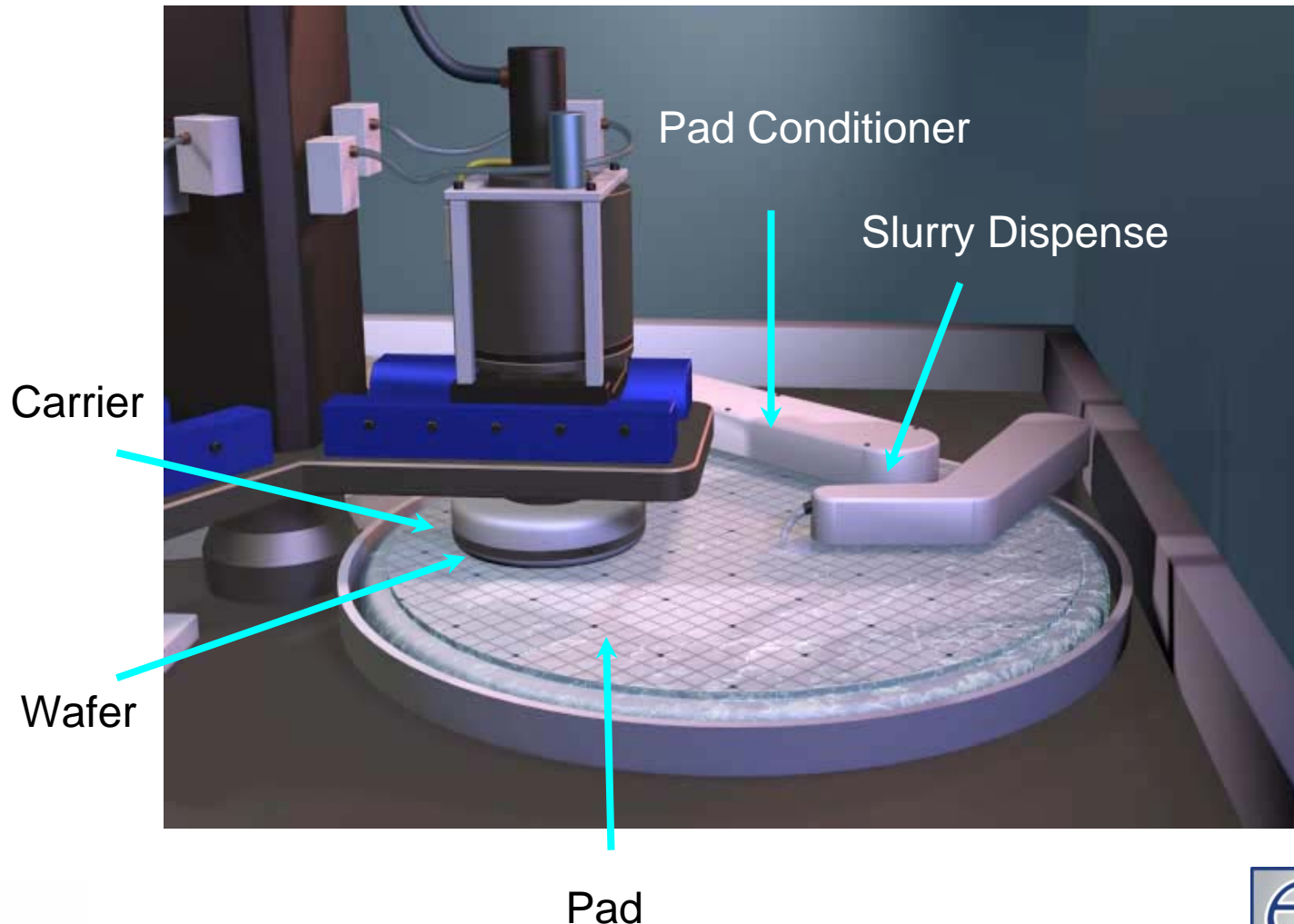
- ◆ World Leader in Chemical Mechanical Polishing (CMP) for semiconductor manufacturing
- ◆ Substantial investment in fundamental science of surface finishing and formulation design
- ◆ All facilities have ISO 9001 and ISO 14001 registration
- ◆ Solutions for Si, SiO_2 , W, Cu, Al, Ni, Ti, TiN, Si_3N_4 , Ta, TaN, Ru, Pt, Ir



Chemical Mechanical Polishing

- ◆ Process using slurry (chemical and mechanical), pad (mechanical) and equipment to produce a surface with the desired attributes.
- ◆ Slurry – colloidally stable, aqueous solution of ceramic abrasive particles and chemistry.
- ◆ Pad – Working surface, generally polymeric.
- ◆ Equipment – means of combining the slurry, pad and process parameters to provide consistent results.

CMP Polisher



Why CMP?

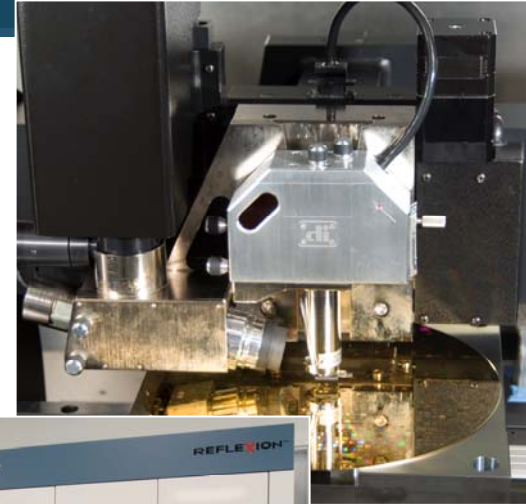
Advantages:

- ◆ Process Simplification
 - ◆ Can eliminate need for separate grind, hone and lapping steps
 - ◆ Could be combined with other process steps to improve overall process efficiency
- ◆ Does not create sub-surface damage to material
- ◆ Ability to polish multiple materials simultaneously
- ◆ Overall range of surface finish

Drawbacks:

- ◆ Time
- ◆ Equipment compatibility

Engineered Surface Finishes

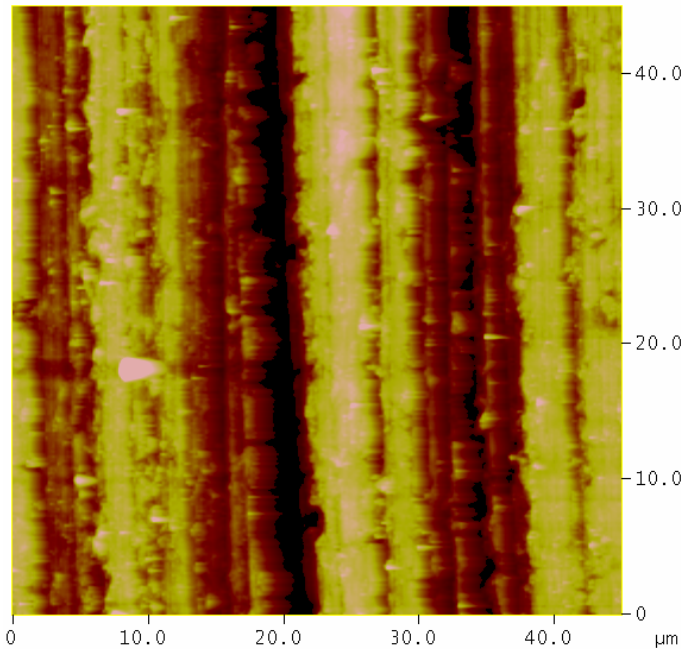


Solutions for

- ◆ Industrial & Medical applications
- ◆ Optics
- ◆ Optoelectronic (FPD, microelectronics, photovoltaic, LED)

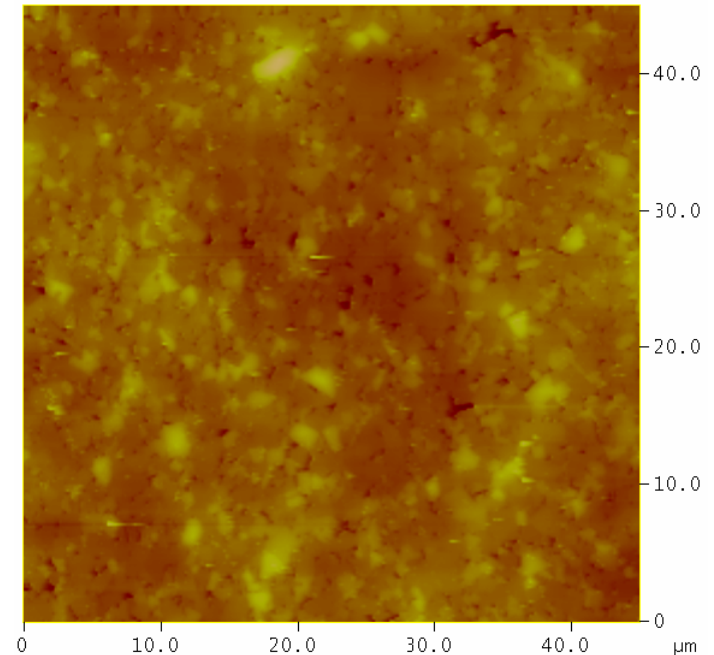


Tungsten Carbide Before & After Polishing



Before Polishing

Surface Roughness (Ra) = 94.5 nm



After Polishing

Surface Roughness (Ra) = 16.3 nm

Results: Improved wear, cut quality, service life, less friction

CMP Polished HVOF Tungsten Carbide



Mag: 20.2 X

Mode: PSI

Surface Data

Date: 05/06/2005

Time: 13:39:12

Surface Statistics:

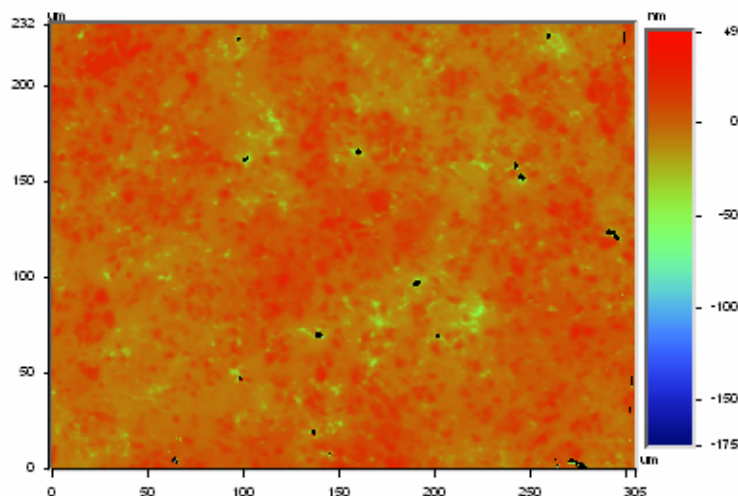
Ra: 5.96 nm
Rq: 7.81 nm
Rz: 128.76 nm
Rt: 223.90 nm

Set-up Parameters:

Size: 736 X 480
Sampling: 415.64 nm

Processed Options:

Terms Removed:
Tilt
Filtering:
None



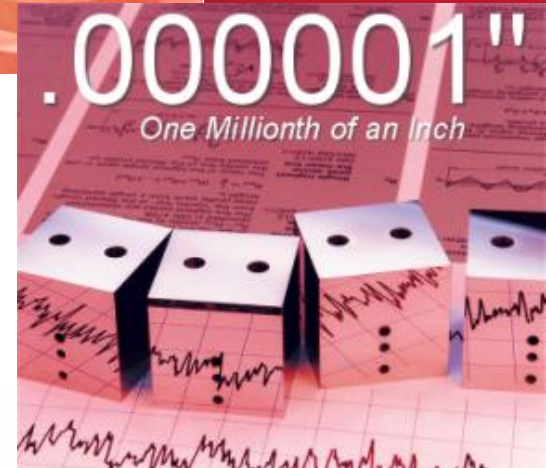
Title:

Note:

- Part courtesy of J. Devereaux, Naval Depot

Additional Capabilities

- ◆ State-of-the-Art Polishing
 - ◆ $\lambda/20$ Precision
 - ◆ Reference Flats
- ◆ Diamond Machining
- ◆ Custom Lapping
- ◆ Submicron Finishing
- ◆ Prototyping
- ◆ Contract Manufacturing
- ◆ Cleanroom/Metrology Services



Surface Finishes

www.surfacefinishes.com

Sample List of Materials

Existing Capability

- ◆ Tungsten Carbide
- ◆ Aluminum
- ◆ Stainless Steel
- ◆ Copper
- ◆ Molybdenum
- ◆ Cobalt Chrome
- ◆ Aluminum Nitride
- ◆ Polysilicon
- ◆ Silicon Nitride
- ◆ Silicon Dioxide
- ◆ Tungsten

Under Development

- ◆ Fused Silica
- ◆ Fused Quartz
- ◆ AlON
- ◆ Silicon Carbide
- ◆ Sapphire
- ◆ ZnSe
- ◆ Germanium